CHAPTER 6

Project Management

After a laboratory has considered the issues discussed in chapter 4 (Major Decisions) *and is prepared to assume responsibility for the identification effort, significant personnel issues must be resolved. For a variety of reasons—including staff morale, public expectations, and economic demands—the response to a mass fatality incident should be handled as a separate project rather than as a part of the laboratory's standard operations.*

Most laboratory directors come up from the "bench," rather than from a management background. Skills in technical troubleshooting, case management, molecular biology, and population statistics are important in the day-to-day running of a forensic laboratory. Managing a mass fatality identification effort, however, requires these skills and more. *A Guide to the Project Management Book of Knowledge* (Newton Square, PA: Project Management Institute, 2004) offers this important guidance for a laboratory director who must respond to a mass fatality incident:

> Organizations perform work. Work generally involves either operations or projects, although the two may overlap. Operations and projects share many characteristics; for example they are:
>
> - Performed by people.
> - Constrained by limited resources.
> - Planned, executed, and controlled.
>
> Operations and projects differ primarily in that operations are ongoing and repetitive while projects are temporary and unique. *A project can thus be defined in terms of its distinctive characteristics—a project is a temporary endeavor undertaken to create a unique product or service. Temporary* means that every project has a definite beginning and definite end. *Unique* means that the product or service is different in some distinguishing way from all similar products or services.

These definitions of "projects" versus "operations" suggest an important principle: a mass fatality incident DNA identification requires constant and diligent project management. The laboratory director (or designee; see *Project Manager*, below) must assess what controls are needed in project planning and project execution. For example, the areas of communications, risk management, and integration with non-DNA disciplines are often overlooked.

Project Functions

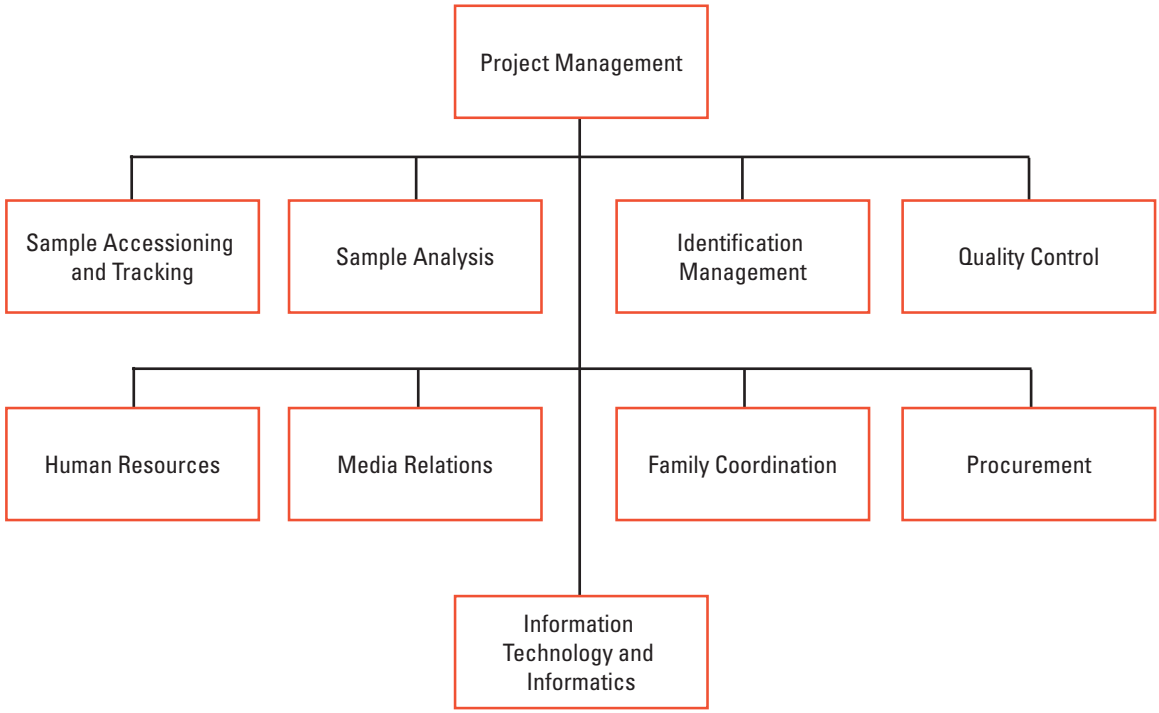
Exhibit 7 depicts the major functions—or disciplines—associated with a mass fatality incident response. In a large response, each function may require a full-time resource; in the response to a smaller incident, one person may be able to fill multiple roles. Regardless of the size of the incident, however, each of these functions should be considered during development of a project management plan. [Note: Many of these functions are discussed in other chapters of this report.]

Project functions can be defined as follows:

Project Management ensures that all functions work in concert to provide accurate identifications as rapidly as possible within budgetary constraints.

Sample Accessioning and Tracking consists of accessioning remains and reference samples, ensuring chain-of-custody documentation, and managing the flow of samples and data within the laboratory and among outsourced laboratories.

Exhibit 7: Major Project Functions



Sample Analysis means performing DNA tests on remains and reference samples.

Identification Management has two parts: (1) making identifications by matching remains and reference samples and (2) reviewing the metadata—information from all sources linked to a particular sample—associated with the reference samples to ensure they were correctly associated with the putative victim.

Quality Control refers to the processes and procedures that a laboratory uses to detect and avoid mistakes. Quality control also ensures that there are no discrepancies between DNA analysis and other modalities (i.e., that the metadata can be reconciled when a conflict occurs).

Information Technology (IT) and Informatics includes the software and hardware that supports the identification effort.

Human Resources focuses on meeting the needs of the staff, volunteers, and consultants who are working on the response effort.

Media Relations involves interacting with the press and establishing how and when information is released to the media.

Family Coordination encompasses educating families, collecting the reference samples and family data necessary to identify victims, and providing information to the families.

Procurement involves ensuring that the correct equipment, supplies, and services are available to the response in a timely manner.

Project Structure: Centralized vs. Decentralized

A centralized project structure, where all samples are accessioned and analyzed by a single laboratory, is the most common paradigm for sample receipt and analysis. The term "centralized" does not necessarily imply a specific physical location or software/hardware architecture.

In a decentralized project structure, more than one laboratory is involved. The laboratory that is ultimately responsible for the mass fatality incident response is called the managing laboratory, and other participating laboratories are referred to as partner laboratories.

Since a mass fatality DNA identification effort most likely would be added to a laboratory's casework, a decentralized structure can be more efficient if good information technology support exists. For example, in a decentralized structure, the human remains samples might be analyzed by one laboratory and the reference samples by another. Both laboratories would analyze samples independently, leveraging their respective strengths, and the overall response undoubtedly would be faster because the laboratories would be working simultaneously.

However, for a decentralized model to work well, there must be a mechanism for centralized data management so that the managing laboratory and the partner laboratory/laboratories can view information and communicate about data, regardless of where they are collected or analyzed. It is especially critical that the managing laboratory have as close to real-time access as possible to all data—including DNA profiles, chain-of-custody documentation, and metadata—that is associated with the mass fatality incident response, because the managing laboratory has the ultimate responsibility for making comprehensive and frequent updates to the families, public officials, the media, and the public. [Note: For example, metadata for a victim's toothbrush include the name of the victim, and when and by whom it was provided.]

Sample accessioning and sample storage can be decentralized as long as each partner laboratory ensures that all of the metadata are accessible by the managing laboratory. The physical samples can be stored at partner laboratories, as well. However, if a partner laboratory disengages from the response effort, all of its samples must be shipped to the managing laboratory under appropriate chain-of-custody procedures.

It is important to consider the administrative review portion of the identification process when deciding between a centralized or decentralized project structure. In a decentralized plan, if the managing laboratory needs to examine the physical item (e.g., toothbrush, hairbrush), the partner laboratory must be prepared to pull the physical item from evidence storage and send it to the managing laboratory or be prepared to provide digital images that can be accessed electronically.

Sample analysis readily lends itself to a decentralized structure. A managing laboratory can divide the workload in several different ways: by DNA technology, by sample type, or some by combination thereof. For example, bone fragments might be shipped to one laboratory for STR and mtDNA analyses, whereas tissue samples would be analyzed in-house. Or partner laboratories might receive entire samples or extracted DNA from the managing laboratory.

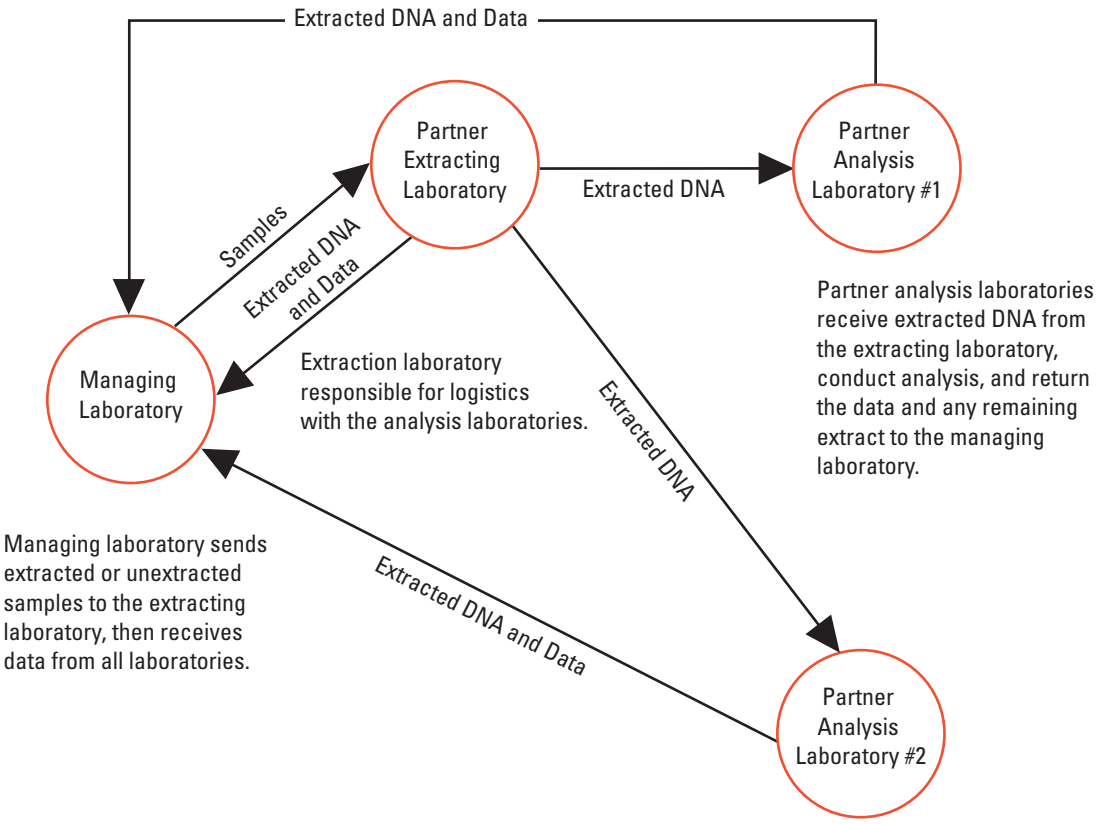
Because the managing laboratory has the ultimate responsibility for maintaining the chain of custody for samples, extracts, and data, it is important to recognize the management challenges presented by these aspects of a mass fatality identification effort. Samples, extracts, and data may be shipped to and from the managing laboratory individually or collectively, at different times and in different batches. Multiple extracts and multiple DNA profiles (data) might be derived from a single sample, and the laboratory's sample tracking system must be able to document and certify the chain of custody for each one. The sample tracking system must collect data associated with all physical transfers, including what was sent, where it was sent, when it was sent, when it was received, and by whom. The managing laboratory uses this information to document the chain of custody and to provide status updates to the public.

The Office of the Chief Medical Examiner (OCME) partnered with other laboratories in the World Trade Center identification effort. The OCME was in the management role—with ultimate responsibility for making the victim identifications—and also performed retesting of the remains and secondary testing of family samples and personal effects. However, the primary testing of bones and tissues and the initial testing of family and reference samples was contracted to outside laboratories with specialized experience.

Robert Shaler

In a decentralized structure with multiple partner laboratories, the managing laboratory must decide how samples, extracts, and data will move among the partners. There are two basic approaches: the daisy-chain model and the

Exhibit 8: Modified Daisy-Chain Workflow in a Decentralized Laboratory Structure



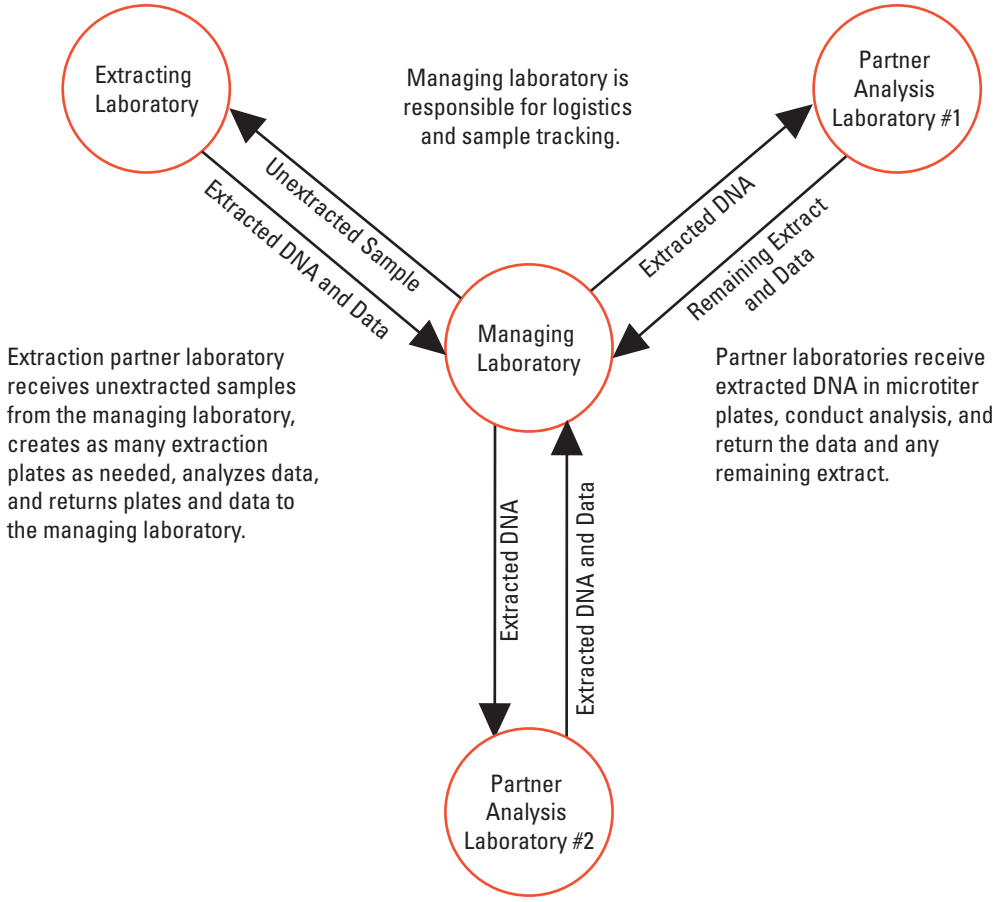
hub-and-spoke model. Both were used in different aspects of the World Trade Center (WTC) DNA identification project.

In the daisy-chain model, samples (or extracts) are shipped to the first partner laboratory, which ships extracts to the second partner laboratory, which ships extracts to the third partner laboratory, and so on. A major drawback to daisy-chaining is that the managing laboratory does not physically control the flow of samples and extracts among partner laboratories, which can make it difficult to locate missing samples and ensure proper chain-of-custody documentation.

When the managing laboratory has a partner laboratory perform DNA extraction, the daisy-chain model can become very convoluted. Exhibit 8 depicts the flow of samples, extracts, and data in a modified daisy-chain structure that would occur when the managing laboratory sends samples to the first partner laboratory for extraction and analysis. In this example, the first laboratory extracts a sufficient quantity of DNA for the two other partner laboratories and ships the extracts to them. Partner laboratories return leftover extracts and data to the managing laboratory. It is important to note that the daisy-chain model requires compatible informatics and hardware systems and shared data transfer protocols so that all parties are sharing information.

In the hub-and-spoke model (see exhibit 9), the managing laboratory centralizes the control and movement of samples, extracts, and data among partner laboratories. Although it is a simpler model than the daisy-chain for tracking chain of custody, locating missing samples, and identifying missing data, there are some limitations. The major disadvantage of a hub-and-spoke structure (in addition to time delays) is that samples or extracts must be packaged and shipped multiple times, which could result in repeated freezing and thawing, potentially decreasing the quality of the

Exhibit 9: Hub-and-Spoke Workflow in a Decentralized Laboratory Structure



DNA in the samples. For example, the managing laboratory sends a batch of samples to the partner laboratory for extraction. When the managing laboratory receives the extracts back from the partner laboratory, it must open the package and verify the contents, then repackage the contents and ship them to the second partner laboratory. This doubles the work as compared with a daisy-chain structure. However, in a hub-and-spoke structure, the managing laboratory has a higher level of control and the possibility of miscommunication between partner laboratories is reduced.

Because of the types of samples in a mass fatality incident (e.g., bone fragments, tissue, personal items, kinship swabs) and the numerous DNA technologies (short tandem repeats, mitochondrial DNA, single nucleotide polymorphisms, etc.), a decentralized structure is often necessary. Moreover, it may be prudent to create different workflow mechanisms for different types of samples. For example, kinship samples may be processed using a daisy-chain model, whereas disaster samples may be better handled using a hub-and-spoke system. Regardless of which project structure is used, however, it is safe to assume that the greater the number of partners, the greater the management complexity.

Identification management is one function that should never be decentralized. The managing laboratory is responsible for setting the parameters for DNA identifications and resolving conflicts with other identification modalities. The managing laboratory also acts as the single point of contact for the victims' families, public officials, and the media on identification-related matters. Thus, it is critical that all data—metadata and DNA profiles—be provided to the managing laboratory.

In the World Trade Center identification effort, both the fire and the police departments frequently asked the Office of the Chief Medical Examiner (OCME) to reprioritize testing of victims' remains. Although it was important to keep the testing queue intact to disrupt the work flow as little as possible, the OCME honored a number of these requests. When this happened, the testing process, including the assignment of personnel, was affected.

Robert Shaler

Special Requests

Although requests for special sample handling may disrupt efficient sample processing, such interruptions are inevitable in the aftermath of a mass fatality event. The laboratory director should plan for these contingencies and construct a separate process to handle expedited requests. The first 72 hours after a major incident will be emotionally charged, with the possibility of many urgent requests that the laboratory perform immediate DNA analyses. Requests for expedited analyses may also occur later in the identification effort, if new remains are recovered or more useful personal items or kinship references become available. In the WTC DNA identification project, the laboratory frequently received instructions to collect and analyze reference samples and search the DNA profiles against the accumulated profiles of tested victim remains within 24 hours or less. Without a process in place for handling such expedited requests, interruptions will affect efficient and orderly sample throughput.

Project Manager

One of the most serious misjudgments a laboratory director can make is failing to recognize the importance of project management. Experience gained during the WTC DNA identification effort, followed shortly thereafter by the crash of American Airlines flight 587 in Queens, New York, showed how crucial it is to avoid the natural tendency to manage a mass fatality incident response as simply another operational activity.

To meet the challenge of maintaining ongoing forensic casework while also responding to a mass fatality incident, a laboratory director should consider appointing a separate project manager to ensure that the response is appropriately executed. If the laboratory director assumes the project manager role, other responsibilities may have to be delegated. This can be an effective solution if the day-to-day operational duties associated with casework or offender analyses can be transferred to other staff. If the laboratory director is unable to delegate some of his or her other responsibilities, a dedicated project manager should be appointed for the mass fatality incident project.

The ideal project manager is someone who understands all facets of a mass fatality incident response. It often is difficult, however, to find someone with this exact skill set. At the least, the project manager should be familiar with all of the disciplines that will be brought to bear, including sample collection, DNA analysis, and information technology. In addition, the project manager should have experience planning and monitoring work and should be comfortable in a team-oriented environment.

The project manager should work with the laboratory director to formulate a strategy for the specific mass fatality incident response. With the laboratory director's consent, the project manager should implement the necessary policies and procedures. The project manager also is responsible for keeping the laboratory director apprised of the project's status and for meeting regularly to discuss progress, risks, schedules, and resources.

Even if the laboratory elects to outsource some of the response activities, a large project management role still exists. For example, the laboratory may choose to outsource the DNA analysis to one or more laboratories and make identifications in-house. This structure requires a project manager to coordinate the movement of samples and data, monitor contract compliance, and ensure that sufficient resources (people, databases, computers, etc.) are available for the identification effort.

Exhibit 10 describes some of the important duties of the project manager.

The project manager can expect the identification process to have two distinct phases. The first phase is characterized by a large number of identifications made in a relatively short period of time. The second phase is characterized by fewer, more difficult, identifications made over a relatively long period of time.

External Relationships

In addition to managing communication within the laboratory, the project manager should manage relationships with external organizations. The laboratory represents just one component of a mass fatality incident response. By working closely with other response participants, the project manager can improve the laboratory's effectiveness and efficiency. (See *Mass Fatality Incidents: A Guide for Human Forensic Identification* online at http://www.ojp.usdoj.gov/nij/pubs-sum/199758.htm.)

Needless to say, every organization has its own mission, goals, and way of conducting business. The project manager should work to understand the cultures of the various agencies and departments with which the laboratory will be working in the identification effort. In addition, the project manager should establish formal and informal channels for receiving and sharing information. For example, by building a relationship with the site recovery team, the project manager can gain insight into the volume and type of samples that will enter the laboratory during a particular timeframe. Exhibit 11 shows some of the organizations that may be involved in a mass fatality response.

Exhibit 10: Project Manager Duties

Duty	Description
Define and manage the project schedule.	The project manager is responsible for creating a schedule, assigning resources, and monitoring progress. Because there are so many unknowns at the beginning of a mass fatality incident response, it may be impossible to create a project schedule with a definite end date. However, the project manager should identify major tasks, create a precedence diagram describing the interrelationships of tasks, and establish work schedules for the project team.
Facilitate communication within the project team.	The project manager is responsible for ensuring that employees in each functional area have the information they need to plan and execute their portion of the response. The project manager should chair frequent, periodic (daily or weekly) meetings with functional-area managers and facilitate a free flow of information. Current and future challenges should be discussed. Decisions should be made only after considering the impact on each function. A classic mistake is excluding the issue of information technology from decisionmaking.
Identify and manage risks.	The project manager is responsible for identifying the major risks to the project's success. Some examples of risks include not having a particular task completed by a deadline, the laboratory information management system failing to support the mass fatality incident response, and sample mixups during accessioning. Risks will be unique to each response and undoubtedly will change as the project unfolds. One proven risk-management technique is to have the management team brainstorm the top 10 project risks, order them from highest to lowest, then identify avoidance and mitigation strategies for each. Ideally, each functional-area manager also manages his or her own top 10 risks.
Optimize the overall project, not one function or discipline.	Management theory says that the only way to optimize a large entity is to suboptimize its various components. Thus, the project manager should shift resources among functions, as necessary, to mitigate risk and ensure success. Even though the functional-area managers may object to losing resources, the project manager is responsible for the overall success of the project. This is another reason why the project manager should understand all of the functional areas.

Because we were asked to identify every fragment of human tissue, the smallest, most damaged samples were repeatedly tested. Each time—particularly, as we optimized protocols—we hoped to reveal a few more loci. The more compromised the sample, the more attempts we made to coax out the data.

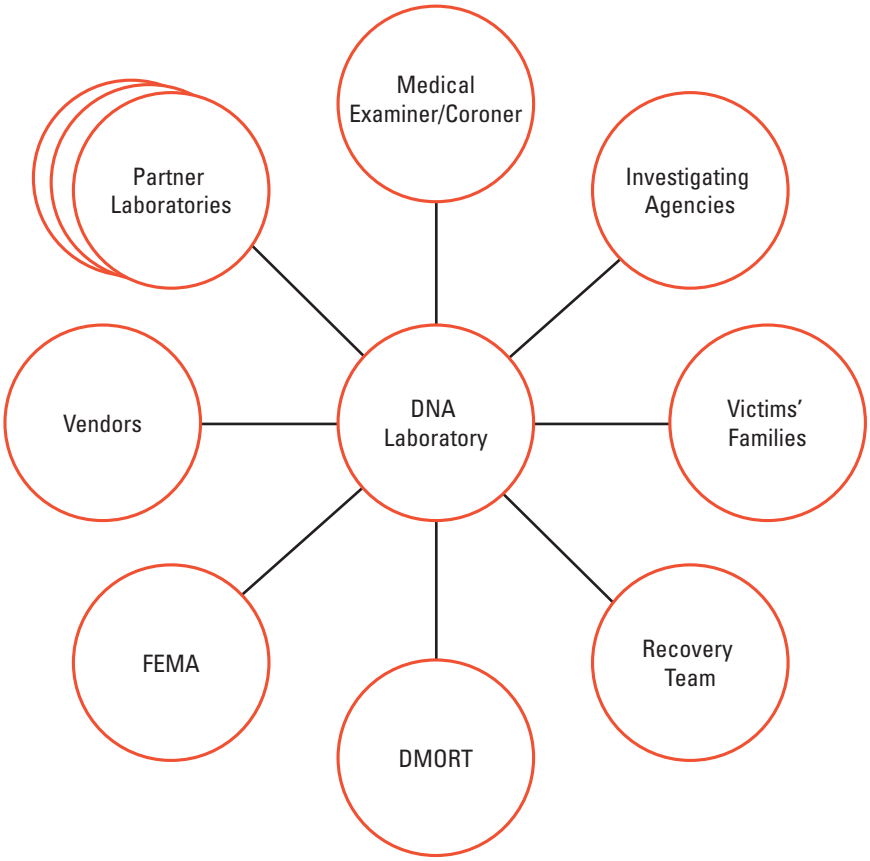
Robert Shaler

Integration of the DNA effort in the overall response to a mass fatality disaster requires extensive communication between the laboratory and all other units with responsibility. One crucial lesson learned during the WTC DNA identification project is that it is impossible to over-communicate during a mass fatality incident response. Aspects of DNA identification may not be understood by other groups that are involved in a mass disaster response; for example, sending a communication about collecting remains in clean paper—rather than plastic—bags could make the difference between obtaining a full 13-locus STR profile and a partial or failed profile. It is the project manager's responsibility to ensure that the laboratory's needs are understood by other response agencies.

As individuals and groups become preoccupied with their own obligations during a mass fatality response effort, it is possible to forget that introducing a seemingly minor change in the DNA identification process can affect the entire effort. To minimize miscommunication, the project manager should establish a single point of contact in each group involved. Regular meetings among key participants should be held. And, although the DNA project manager may initially have to guide the discussion to reduce digressions, these formal lines of communication are crucial.

The project manager should meet with the ME at least once a week. The meeting agenda should include:

Exhibit 11: Organizations Involved in a Mass Fatality DNA Identification Response



- Overall project status from the perspective of the ME and the DNA laboratory.
- Sample collection, storage, and tracking issues.
- Identification issues across modalities.
- Information technology requirements and problems.
- Information to be presented to the media.
- Anticipated workload and possible constraints.

Representatives of the laboratory, designated by the project manager, also should plan to meet with partner laboratories at least once a week. The agenda for these meetings should include:

- Overall project status, including issues regarding the transfer and tracking of samples or extracts.
- Problems and solutions regarding sample analyses and data.
- Anticipated workload and possible constraints.

These meetings may be more effective if they are conducted one on one with representatives of the partner laboratories or with the entire partner laboratory staff. Meetings with other agencies (e.g., Federal Emergency Management Agency, investigating agencies) can be less frequent, but also should occur regularly and have written agendas.

Human Resources

Following a mass fatality incident, consultants and volunteers may be called upon to supplement the capabilities of the laboratory. The project manager is responsible for ensuring the coordination of these resources.

It is fair to assume that the DNA response to a mass fatality incident will require a rapid ramp-up of staff to support the collection, accessioning, and information technology processes and beginning sample analyses. Staffing requirements are likely to peak at the time that multiple processes—for example, sample collection, analyses, identification—occur simultaneously. After the bulk of the samples have been profiled, staffing needs should begin to taper off, with the identification analyses and quality control processes assuming the bulk of the requirements for the remainder of the project.

The staffing requirements for the World Trade Center DNA identification effort followed a skewed bell-shaped curve (see exhibit 12).

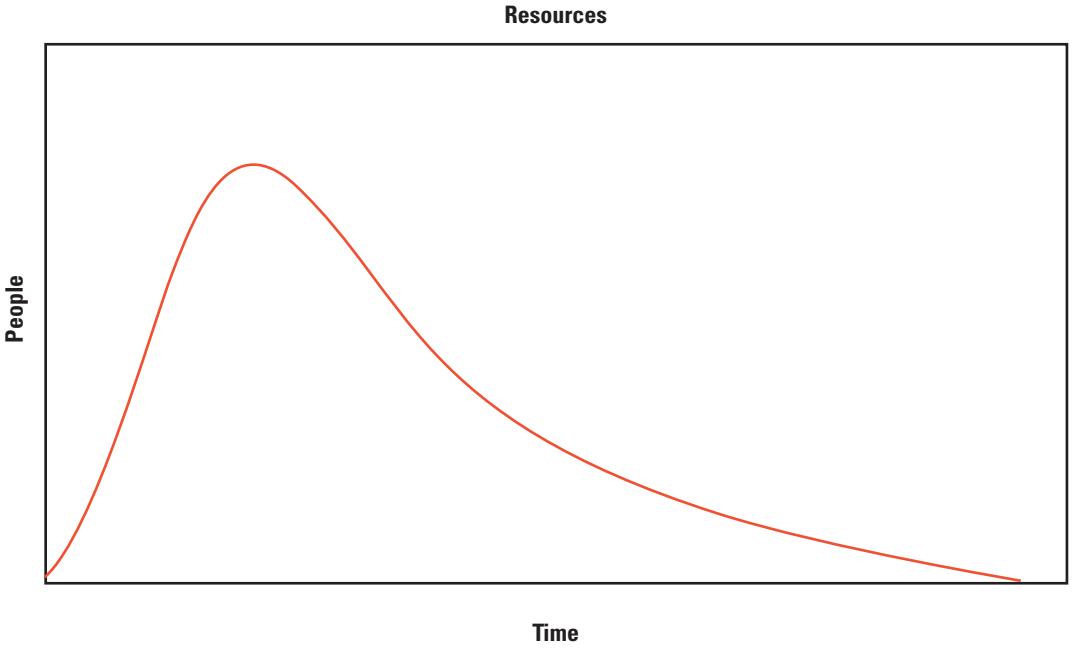
A laboratory responding to a mass fatality disaster may not have sufficient staff onboard for the peak times and may have to seek outside resources for part or all of the project. Typically, consultants are hired for a specific purpose or a specialized task. For example, the laboratory may augment its identification capability by hiring a specialist in genetic and kinship analysis to scrutinize complex pedigrees. Or, the laboratory may contract for specialized information technology expertise. Because most crime laboratories are part of the public sector, it usually is easier to hire consultants for short-term engagements. This allows contract amounts to be kept below procurement ceilings and can expedite the procurement process.

It was virtually impossible to manage both routine casework and a mass fatality event the size of the World Trade Center without help. We immediately established disaster teams in the laboratory and appointed a liaison between the New York State Police and the Office of the Chief Medical Examiner laboratories. I kept managerial control of the WTC work and charged the deputy director with the daily operation of the laboratory.

Robert Shaler

Volunteers who assist in the DNA identification after a mass fatality incident can be professional or nonprofessional. Professional volunteers are already trained in some facet of the mass fatality incident response and are able to assume some of laboratory staff's duties. Examples include Disaster Mortuary Operational Response Teams (DMORT) personnel, medical students who assist in the morgue by accessioning samples and cutting tissue, former employees (e.g., retirees), and volunteers from other laboratories. Nonprofessional volunteers—those without specialized training in sample collection or analysis—may be used to relieve laboratory personnel from some administrative and clerical duties. For example, nonprofessional volunteers might perform data entry or routine paperwork. Before assigning duties to a volunteer, the project manager should understand the scope of the volunteer's commitment. Because volunteers work free of charge and may leave the laboratory on short notice, the project manager should avoid assigning mission-critical tasks to volunteers.

Exhibit 12: Staffing Requirements Over Time



Laboratory directors should be aware of liability issues that might arise if consultants or volunteers are used. For example, confidentiality agreements should be signed by consultants and volunteers, stating that no data or information related to the DNA identification effort may be published or conveyed to the media without prior written consent of the laboratory director or a person designated by the laboratory director. The agreement also should state that no personal information should be disclosed regarding the victims, the state of the remains, or any other aspect of the incident that the consultant or volunteer learns as a result of working on the DNA identification effort. A comprehensive confidentiality agreement can help protect the laboratory from premature, unconfirmed reports and the victims' loved ones from suffering the insensitive divulging of gruesome details.

The project manager also shoulders the burden of being alert to the staff's mental health. When issues concerning staff health and well-being arise, the project manager must immediately involve the laboratory director, who may request professional advice. One way to help maintain morale is to keep the staff as fully informed as possible. Open communication between management and staff is essential to establishing and maintaining high morale. In the rush to respond to a mass fatality incident, information-sharing with staff can be neglected. But, a fully informed staff that understands upcoming challenges and goals can help management anticipate problems and overcome obstacles.

Laboratory workers are likely to experience a range of emotions throughout the DNA identification response, and, in fact, there can be a long-term emotional impact on those working on a mass fatality response. Laboratory personnel who worked on the WTC response reported experiencing extremely high stress levels. Laboratory directors or project managers must be alert to signs of burnout, depression, and other psychological reactions; they must recognize the need for—and be able to implement—stress release mechanisms. The laboratory director and the project manager should also make employees, consultants, and volunteers aware of available mental-health or other stress-relieving assistance programs.

One important difference between a mass fatality response and routine forensic casework is that, over time, laboratory staff may become intimately familiar with the lives of the victims. By the end of the response, laboratory staff is likely to know the name, gender, date of birth, family structure, and next of kin of many of the victims. Staff may learn if relatives are not aware that they were not biologically related to the victim or that some family members are estranged. Because of the nature of a mass fatality—where the suffering of many is shared by the community as a whole—laboratory staff may find themselves empathizing with the victims' families, sharing their bereavement.

There also will be additional stress on laboratory staff who are *not* assigned to the mass fatality response. If a laboratory must also continue to meet its casework and offender-processing commitments, some staff will likely need to assume the workload and responsibilities of colleagues who are assigned to the mass fatality response. Over time, this can lead to resentment. Some staff members may be unhappy about not being assigned to the mass fatality incident response; or the priority of the mass fatality incident over traditional casework may make them question their value to the laboratory. A team environment fostered by the laboratory director or project manager will help staff members support each other throughout the DNA identification effort.

The laboratory director and the project manager should continually assess stress levels within the laboratory, bringing in experts, if necessary, to help with the assessment. Because of the demands of the work, it may not be easy to spot behavioral or attitudinal changes in staff members. However, the laboratory director and project manager should watch for stress-related symptoms such as crying, a haggard appearance, a normally calm individual becoming argumentative, or a normally extroverted individual becoming quiet and withdrawn.

Every staff member worked tirelessly, in the hope that perhaps their effort would bring a modicum of comfort to the victims' despairing friends and relatives. The task was huge, and small miracles were performed daily. The emotional toll on New York State Police personnel was obvious, showing in their faces, weighing on them, but they never gave up.

Barry Duceman

In the WTC response, for example, there was an employee assistance program available to laboratory personnel, in addition to the following assistance for all employees, consultants, and volunteers who were working on the recovery effort:

- Sal's Café: The Salvation Army provided free breakfast, lunch, and dinner to anyone working on the WTC project.
- A national massage therapy association provided massages, including reflexology, through an arrangement with the city of New York.
- Religious ceremonies were regularly conducted, and religious leaders of many faiths were available in the mortuary for families and workers.
- Project Liberty, a group of mental health professionals, provided free counseling.